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Reading Your Face: Do I Know Enough to Interpret How You Feel?

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Reading Your Face: Do I Know Enough to Interpret How You Feel?

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Biography

The author was born in Ulsan, South Korea, on January 23, 1995. Youlim graduated from Luhe High School in Beijing, China, 2013. Youlim received her bachelor's in psychology from College of Saint Benedict / Saint John's University, Saint Joseph in 2017.

Table of Contents

List of Tables

List of Figures

Abstract

The present study examined how individuals' self-construal impacted their recognition accuracy and confidence in interpretation. Previous findings suggest that individuals with independent self-construal perceive the individual as a causal agent of emotion; however, individuals with interdependent self-construal believe that emotional expression is used to communicate with others. Hence, interdependent people perceive the situation as a causal agent of emotion expression. The present study assessed if self-construal influences people's needs for contextual information when making emotional judgments. Participants (N = 242) were randomly assigned to either an independence-primed or interdependence-primed condition. Within the priming condition, participants additionally looked at 4 pictures of (1) happy faces, (2) fearful faces, or (3) neutral faces. Participants interpreted the facial expressions and rated their need for contextual information, pleasantness of expression, confidence in interpretation, and desired affiliation. Results indicated that interdependent participants reported more needs for contextual information and less confidence in interpretation than independent participants. Facial emotions also influenced participants' needs for contextual information and confidence in interpretation. Neutral faces elicited the highest need for contextual information, and fearful faces elicited higher need for contextual information than happy faces. Happy faces elicited higher confidence than fearful and neutral faces. A Chi-square test reflected that there was a significant association between facial emotions and recognition accuracy. In addition, highly confident participants reported being more comfortable having further interactions than less confident participants. Participants' accuracy of fearful faces was significantly correlated with their ratings of valence but

not with their ratings of arousal. The present study offers a direct examination of the relation between self-construal and emotion understanding.

Keywords: Self-construal, contextual information, emotion understanding

Introduction

Research on facial expressions has proliferated since Darwin (1872/1965) pointed out its importance in humans. Many empirical findings demonstrate that people express emotions through their faces. People convey internal states, such as emotions, motives, needs, and intentions through a facial expression (Ekman, 1992). For example, a smiling face reflects a pleasurable experience at an amusement park, but a crying face displays sorrow at a funeral hall. Happiness and sadness are not easily described in words. Expressing them facially can help convey these feelings to others. In this way, facial expressions transform feelings into observable behavior.

Facial expression is used as a socio-cultural tool, interconnecting people. Ekman (1992) specified the importance of facial expression because it is used not only for conveying the expresser's inner feelings, but also for communicating with others. A facial expression contains information about the relation between the expression and its environment so it conveys internal thoughts (Scherer & Wallbott, 1994). In this sense, an expression provides the information about emotional feelings as well as internal thoughts. During interactions, for example, a smiling face reflects enjoyment. Consequently, a smiling face indicates that the conversation can be continued. On the contrary, an anxious face reflects that the conversation topic is not appropriate so the interaction should be stopped or the topic should be changed. From another perspective, instead of reflecting feelings, a facial expression is used to facilitate interactions. An expression of enjoyment activates the interaction but an expression of anxiety deactivates the interaction. In sum, people engage in emotional expression to communicate with others, because using emotional expression helps people to maintain a positive interaction with others.

Emotion Understanding

Although modern psychologists agree that emotion perception, emotion regulation, and emotion understanding are three emotion domains (Joseph & Newman, 2010), the latter is still underexplored. Emotion understanding refers to the ability to understand emotion in complex ways including labeling emotions, interpreting the meanings of emotion, understanding complex emotions, and recognizing emotion patterns over time. It is important to investigate how people understand others' facial expression, because facial expression serves as a communicative and adaptive function in social interaction (Ekman, 1992). Humans are a social species that need to interact, and that emotional understanding is an important part of that. Not being involved in a group may decrease the survival rate of individuals, so maintaining positive coordination is essential for their survival. In other words, a successful communication creates a social coordination through affiliation between interaction partners. Therefore, the ability to understand a facial expression is crucial in a social society.

People need to interpret others' facial expressions when they are interacting with others. Emotion expression is typically considered as six basic and universal expressions: happiness, anger, sadness, fear, disgust, and surprise. An expression provides potential information to an observer. To engage in positive interactions, individuals need to make immediate and accurate inferences about the connection between the expresser and the environment. The present study consequently theorized that if the observer cannot interpret the expresser's facial expression, the observer might not be comfortable to have further engagement with the expresser because the observer wants to avoid deteriorating the relationship.

Emotion Context

As socio-cultural tools of interconnecting people, facial expressions do not occur in a vacuum. They often convey not only internal states, but also a larger social context in which they occur (Hess et al., 2015). For example, when an individual shows a sad face when listening to a friend talking about his or her suffering, the individual wants to show what they feel to the friend, and the individual also wants the friend to know that they feel empathy for the friend. The expression of sadness is not to reflect sadness but is to interact with the friend.

Because social interactions require dyads or multiple people to understand each other's internal states, the ability to accurately interpret a facial expression plays a crucial role during interactions. However, people are not always confident in their understanding of facial expression. A facial expression is often not enough for people to decide emotional judgments. The expression itself is so ambiguous that people need additional context to recognize it (Hassin et al., 2013). Therefore, the expresser needs to provide reliable information to allow the observer to interpret the expression.

Indeed, researchers have asked participants to interpret the emotion expressed by an isolated face (Tottenham et al., 2009). Their assumptions were unrealistic because people do not use only the stimuli, facial expression, in emotional judgments. In everyday life, people use information from motion, social or situational context that can influence the observer's understanding of its meaning. People often combine all information, such as body motion, landscape, and relationship, when they are looking at a facial expression. Taking the example of expressing sadness when listening to the friend's complaint, the individual expresses by their face as well as body language such as hand motions. In this case, the friend would be able to detect the sadness through these two contexts.

Many researchers have been interested in the topic of contextualized emotion recognition because emotion understanding is not a simple facial recognition matter. Facial expressions are more ambiguous than we think. In the real world, facial expressions are spontaneous, blended, and subtle, so the observer needs contexts to interpret them. When making an emotional judgment, the observer's ability to use all contextual information about the expression allows for an improvement in the accuracy of the judgment. The observer routinely makes use of whatever context is available and makes a specific inference about the target facial expression accordingly.

Emotion Ambiguity

Context also helps people to detect the emotional information encoded in facial configuration, but it sometimes can mislead the observer to encode a facial expression into a wrong recognition (Barrett et al., 2011). People decide whether the perceptual information or the affective information makes the greatest contribution to the interpretation of expressions with their semantic knowledge and contextual information (Russel, 1994; Barrett, 2006). The observer makes an inference about emotion expression based on all information they can obtain from the expresser and the environment. Neither the perceptual information nor the affective information alone helps the observer make an emotional judgment (Barrett et al., 2011; Calvo & Nummenmaa, 2016). The observer looks at facial configurations, assumes if the expression is pleasant or unpleasant, and applies that information into their semantic knowledge and contextual information about the emotion.

In everyday life, facial expressions are not prototypical and full-blown. Matsumoto and Hwang (2014) define subtle facial expressions as low-intense and/or few appearances changed emotional expressions. People do not always express their

emotion through prototypical and high-intensity facial expressions. Subtle versions or variants of the prototypes of facial expressions frequently occur during interactions. The observer consequently needs to rely on social knowledge and context, beyond facial muscle configuration, when he or she is interpreting a spontaneous expression because of its loss of prototype (Hassin et al., 2013). The observer might not be able to accurately interpret an expression without additional information, social knowledge and context. The present study consequently assumed that participants would need additional information when they look at a subtle expression than when they look at a prototypical expression.

The six basic emotional expressions can be readily distinguished from one another. However, people recognize happy faces more accurately and faster than all other faces (Leppänen & Hietanen, 2004). Nummenmaa and Calvo (2015) also conducted a meta-analysis to measure the average matching scores of the 17 cross-cultural judgment studies, providing statistically significant differences on recognition accuracy across types of emotions. Participants' accuracy was significantly higher for happy faces (89%) than for all other basic expressions. More specifically, proportions of recognition accuracy were 83% for surprise, 71% for sadness, 68% for anger, 65% for disgust, and 59% for fear. Therefore, the present study assumed that participants would be more accurate on interpreting positive expressions than negative expressions. Especially, the recognition accuracy of fearful faces would be lower than the accuracy of happy faces.

Not only proportions of recognition accuracy are different among six basic emotions, but people are also often confused by these emotions. For example, people often be confused between disgust and anger as well as between fear and surprise (Wang et al., 2019). Another study compared recognition accuracy of neutral and

prototypical emotional expressions of the same individual (Matsumoto & Hwang, 2014). Participants were randomly assigned to one of two pools, Pools A and B, with each pool containing 55 expression sets to judge target expressions (i.e, anger, contempt, and fear). Matsumoto and Hwang created the stimuli portraying prototypical and variant versions of the various emotions and manipulated low-intensity versions of full-face and prototypic expressions, including variants of those expressions. They also defined that faces with higher intensity portray more muscles configurations; faces with less intensity portray fewer configurations at less intensity.

Matsumoto et al. (2014) split the stimuli into two pools because judging 110 expressions in one sitting was too cumbersome. For each expression, they asked participants to watch a 2-seconds presentation of the target expressor's neutral face, and then a 1 second presentation of the target subtle expression. After then, participants look at the same neutral face again. When participants were looking at the second-shown neutral face, they made a judgment selection from the fixed-choice list: anger, contempt, disgust, fear, joy, sadness, surprise, neutral, and other. They found out that critical muscle configuration played an important role on people's emotional interpretations whereas signal clarity, muscle configurations, predicted accuracy of recognition. Intensity clarity did not influence participants' recognition accuracy. The intensity clarity was not correlated with recognition accuracy while signal clarity was positively correlated with recognition accuracy. A limitation of this finding is the presentation method. The authors utilized a dynamic presentation methodology. The participants were able to imbed the target expression within a forward and backward mask of the same expressor's neutral faces. Krumber et al. (2013) demonstrated the advantage of dynamic presentations. When facial expression is presented in sequential condition, dynamic presentation allows to track facial movements with greater

coherence and to compare with other facial emotions with more configural information.

Cognitive science has endorsed the idea that neutral expression is an additional basic facial expression of emotion and provided a number of studies on the recognition accuracy of neutral expressions. Although it is relatively high, Leppänen et al. (2004) argued that depressed patients could not recognize neutral faces accurately. Depressed patients perceived neutral faces as ambiguous. Ambiguity of neutral face leads depressed patients fail to recognize the neutral face. In this sense, when the observer perceives a neutral face as ambiguous, they may fail to interpret it. Another perspective of neutral expression is that contextual information has a strong impact on recognition (Carrera-Levillain & Fernandez-Dols, 1994; Suess et al., 2015). For example, verbal descriptions along with neutral faces influence their interpretations (Wieser et al., 2014). A facial configuration provides perceptual information, but contextual information can change the perception of neutral faces. Contextual information changes the perceptual information of facial expression. In this sense, perceptual and contextual information altogether form interpretation of emotions; however, when the observer perceives an expression is ambiguous, the effect of contextual information is stronger than the effect perceptual information. The present study consequently hypothesized that participants would seek contextual information when they were looking at a neutral face because of its ambiguity.

Cultural Differences in Emotion Understanding

As a socio-cultural tool, facial expression unsurprisingly differs across cultures. Emotion expression is importantly implicated and embedded in social situations. More specifically, agency of facial expression is strongly related to independent and interdependent self-construals. Independent individuals perceive

themselves as unique and distinct from others, whereas interdependent individuals perceive themselves as members of the collective group (Markus & Kitayama, 1991). Although the ultimate consequence of using a facial expression is the same for those with independent and interdependent self-construals, they may use the expression differently when they interact with others. An independent person mainly conveys internal states, hoping others can interpret the expressed feelings; however, an interdependent person regards facial expression as an instrumental action, intending to maintain positive interactions. Matsumoto et al., (2009) demonstrated that independent individuals consider cross-context *consistency* as the norm while interdependent individuals consider cross-context *inconsistency* as the norm. When interpreting the target facial expression, independent individuals do not need contextual information to the same extent as interdependent participants because they believe that context does not significantly influence the expresser's facial expressions. On the other hand, because they believe that people's behaviors depend on contexts, interdependent individuals need contextual information to interpret a facial expression. Indeed, Matsumoto et al. (2012) found that both Japanese and South Korean participants used more contextual information than American participants to make emotional judgments.

The cultural background influences people's emotion understanding (Fang et al., 2019) as well as people's sensitivity to contextual information (Kitayama et al., 2003). In a related set of experiments, Masuda and colleagues (2008) examined how people's emotional judgments are affected by the presence of surrounding individuals. Participants looked at a cartoon image of a central figure displaying an angry face, for example. The central figure was surrounded by a group of other individuals displaying happiness. The results suggested that Japanese, who have an

interdependent self-construal, were influenced by the surrounding context. On the other hand, Americans, who have an independent self-construal, were not significantly influenced by the surrounding context.

To extend the understanding of cultural differences on context effect, Ito et al. (2012) examined how presentation and congruency of the contextual information influence people's reaction time to interpret facial expressions. They recorded participants' reaction time and accuracy for each trial. In their first study, participants looked at a person located at the center of a picture with either a positive (natural) or negative landscape (industrial) as background. They presented landscape in either simultaneous condition (study 1A) or sequential condition (study 1B). In the simultaneous condition, the target and landscape were presented altogether but the presentation of landscape was presented after the presentations of target in the sequential condition. In the congruent condition, the target's expression was congruent with the background landscape (e.g., negative facial expression versus negative landscape). In the incongruent condition, the target's expression did not match the background landscape (e.g., positive facial expression versus negative landscape). In their second study, they replaced landscape by surrounding people. They operated the same procedure as they did in study 1. The pictures were presented either simultaneously or sequentially and either congruently or incongruently. Both studies showed that presentation timing and congruency impacted Japanese participants as well as Canadian participants. Reaction speeds increased when a time lag between context and the target was increased for both groups. Incongruency also increased reaction speeds for both groups. These two studies in general indicate that both cultures share a similar degree of contextual effect, which disconfirm the findings of Masuda et al.'s (2008) study. Although Masuda et al.'s study indicated

that contextual effect, surrounding people, impacted Japanese participants to make a different emotional judgment from American participants, cultural differences on contextual effect did not occur in Ito et al.'s study.

The incongruent findings of Masuda et al. (2008) and Ito et al. (2012) can be due to different measurements. Masuda et al.'s study measured participants' perceived emotional intensity whereas Ito et al.'s study examined participants' reaction speeds. Although Ito et al.'s study reveals that independents use contextual information to the same degree as interdependents, it does not explicitly assess how contextual information impacts people to interpret facial expressions. A question that if individuals' self-construal impacts on use of contextual information arises. The present study thus assumed that individuals' self-construal would influence their needs for contextual information based on the findings of Hassin et al. (2013) and Ito et al. (2012). The investigation on cultural differences in context effect in people's emotion understanding is needed because modern society is becoming increasingly globalized. Many people nowadays interact with others from different cultural backgrounds. Not taking account of cultural differences during interactions will cause cultural misunderstandings. For example, the collectivistic observer may use both perceptual information of facial expression and contextual information to interpret the individualistic expresser's facial expression. Although the individualistic expresser is trying to reflect his or her inner feelings, the collectivistic expresser believes that the expression reflects social context.

Research Questions

Current research examined the extent to which participants needed contextual information to interpret ambiguous facial expressions and whether participants could accurately interpret facial expressions. Although many empirical studies have

examined cultural differences on contextual effect, they used indirect measurements to see if participants used contextual information when making emotional judgments. For example, Masuda et al. (2008) measured participants' intensity ratings and Ito et al. (2012) measured participants' reaction time. Both studies did not directly assess contextual effect. They operationalized that reaction time and intensity rating can indirectly reflect if participants used contextual information. However, indirect measurements might not help researchers assess unmediated or unmoderated contextual effect on emotion understanding. Hence, instead of measuring participants' ratings of emotion intensity or reaction time, the present study used direct measurements, asking participants if they need contextual information to interpret the target expression.

Participants looked at three types of facial emotions: happy faces, fearful faces, and neutral faces. Neither perceptual information nor affective information of expression alone may be sufficient for participants to interpret a facial expression. Participants who perceive an ambiguous facial expression should need additional, contextual information, to interpret it. Participants who perceive a prototypical facial expression (full-blown expression), should be confident to make an emotional judgment without contextual information of expression. Consequently, participants should report higher needs of additional contextual information when they interpret ambiguous facial expressions (neutral and fearful faces) than unambiguous facial expressions (happy faces). Participants should need the most contextual information for neutral faces, because neutral faces are strongly ambiguous without contextual information. This hypothesis was based on the results of the pilot study in which participants had low accuracy of neutral expression recognition. In the pilot study, participants looked at 8 different neutral faces and judged and reported if they needed

additional information to interpret the faces. Participants significantly requested contextual information to make emotional judgments. Furthermore, many empirical findings suggest that a fearful face has the least accuracy among six basic expressions. Participants would have the highest accuracy in interpreting happy faces and the less accuracy in interpretation of fearful or neutral faces. Calvo and Nummenmaa (2016) conducted a meta-analysis to examine the effect of affective valence. The results indicated that affective valence does not contribute significantly to expression recognition, even though affective significance is extracted automatically from facial expressions. The present study consequently hypothesized that there would be a weak or no correlation between perception of affective valence and recognition accuracy for fearful faces.

In the present study, participants were primed with either independent or interdependent self-construal. It was difficult to recruit even numbers of participants representing both cultures, so we adapted self-construal priming to examine cultural differences on emotion understanding. Participants primed with independence would seek less contextual information than participants primed with interdependence because independent individuals are more confident of their decision-making ability than interdependent participants (Mann et al., 1998). Independent participants would seek contextual information to back up their interpretations of faces because they are less confident about their original decisions. Participants' self-construal would be measured to check the effect of cultural priming. Confident participants would be more comfortable to further engage with the target, while less confident participants would not be comfortable to engage with the target to avoid having deteriorated interactions with the target. Understanding emotion expression helps the observer

identify whether the interaction is engaging. In sum, following statements are the present study's hypotheses:

Hypothesis I. Independence-primed group would need less contextual information to interpret faces than interdependence-primed group.

Hypothesis II. Participants would seek the most contextual information to interpret neutral faces compared to fearful and happy faces.

Hypothesis III. The recognition accuracy of the happy faces would be higher than of the fearful faces.

Hypothesis IV. Independence-primed group would be more confident about their interpretation of expression compared to interdependence-primed group

Hypothesis V. Highly confident participants would be more comfortable to have further interactions than less confident participants.

Hypothesis VI. There would be a weak or no correlation between participants' pleasantness ratings and participants' accuracy of fearful faces

Method

Research Participants

242 Undergraduate psychology students ranging from 17 to 40 years old (M = 19.7, SD = 2.94; 169 female) at DePaul University in Chicago signed up to participate in the present study. Among those who reported their identified ethnicity groups, 113 participants self-identified as White or European American (48.9%), 42 as Latino (18.2%), 32 as Bi-racial (13.9%), 19 as Asian or Asian American (8.2%), 19 as Black or African-American (8.2%), and 6 as other ethnicity groups (2.6%). As the materials were created for English-speaking participants, all participants were required to be fluent in English. All participants were recruited from DePaul's SONA system to participate in the lab experiment. Participants received 0.5 SONA credit upon

completion of the survey. Data from 11 participants were excluded because they did not complete the experiment (4.5%), leaving 231 participants.

Materials and Procedure

Priming pictures. After consenting, participants looked at a series of pictures for 1 minute. Pictures depicting groups or individuals were used to prime participants' self-construal. Because interdependent individuals perceive themselves as embedded within social relationship whereas independent individuals view themselves as independent from others (Markus et al., 1991), the present study hypothesized that group pictures would prime participants' interdependent construal and personal pictures would prime independent construal.

Stimuli. The present study used pictures of facial expressions from the Chicago Face Database (Ma et al., 2015) to examine how participants judge a target's facial emotion in the real world. The database contains standardized photographs of male and female faces of varying ethnicities between 17 and 65. The physical attributes and subjective ratings of the faces in the database were rated by independent judges. This study's selected pictures included faces categorized as White neutral faces, White happy faces, White fearful faces, Black neutral faces, Black happy faces, and Black fearful faces. When selecting neutral faces, the extensive norming data for each individual model was used. The neutral faces were chosen based on the criteria that there was precisely no rating difference between happiness and fear.

Measures

Manipulation check for emotion recognition. To assess participants' ability to accurately recognize facial expressions, they were asked to rate 7 facial expressions (six basic emotions + neutral face) that were not included in the experiment's stimuli. To be included in, the accuracy of all expressions is at chance level (65%) or lower,

their data would not be used. The present study decided to use 65% as a cut-off rate because Calvo et al. (2016) argued that the average proportion of guessing is .65. Twenty-seven participants were excluded from all analyses because they scored lower than 65% of recognition accuracy in manipulation check (11.7%), leaving 204 participants for analysis.

Individualism and Collectivism. To examine the effectiveness of the priming, participants completed 6 items adapted from the Individualism and Collectivism Scale at the prescreening stage (Singelis, 1994), designed to measure people's independent and interdependent self-construals. After completing the manipulation check for emotion recognition, participants completed the other 4 items adapted from the Individualism and Collectivism Scale. In total, the Individualism and Collectivism Scale includes 5 items measuring independent self-construal (e.g., “I enjoy being unique and different from others in many respects”) and 5 items measuring interdependent self-construal (e.g., “My happiness depends on the happiness of those around me”). Each participant's self-construal score was calculated by subtracting the mean from interdependent subscale's mean from the mean of the independent subscale. Higher number indicates higher levels of individualism. Because the priming condition did not influence participants’ self-construal, we combined the scales used at the prescreening stage and after the priming condition. The alpha reliability for the independent subscale was .49 and for the interdependent subscale was .32 with the average inter-item correlation of .22. Although the alphas were low in the present study, we decided to accept the low alphas. According to Perry et al. (2004), Cronbach’s alphas tend to be low (e.g., .50) when scales have less than 5 items. Low alphas are also acceptable if the average inter-item correlation for the items fall in to range between .20 and .40 (Cohen & Swerdlik, 2005).

Needs for contextual information. Participants completed four items designed to assess their need for contextual information to interpret target's expression. The An example of item is "It is hard to understand this person's feeling without knowing what this person has just experienced". Participants responded on scales ranging from 1=extremely disagree to 7=extremely agree.

Accuracy of Recognition. Participants were told to choose certain emotions on the faces of people. The choices for those emotions ("anger", "fear", "disgust", "sadness", "happy", "surprise", and "neutral") were provided, and they were shown in random orders.

Pleasantness of expression. Participants answered two questions to measure the pleasantness and intensity of targets' emotional expression on scales anchored with 1=very low and 7=very high. Participants rated valence of expression. The question provided to them was, "How positive or negative emotion is in this expression?" ranged from 1=very negative to 7=very positive. Participants also rated arousal intensity of expression, "How much emotion arousal is in this expression?" ranged from 1=very low to 7=very high.

Confidence in Interpretation. Participants rated their level of confidence scales anchored with 0=not at all confident and 4=extremely confident.

Desired Affiliation. To assess the association between confidence in interpretation and desired affiliation, participants rated their comfort with having further interactions with the target, ranging from 1=very uncomfortable to 7=very comfortable.

Procedure

This study used a 2 (Priming condition: independent, interdependent) x 3 (Facial emotions: happy, fearful, neutral). All study materials were presented via

Qualtrics Survey Software. Participants rated 6 items from the Individualism and Collectivism Scale (Singelis, 1994) at the prescreening stage, and they indicated their willingness to participate in the present study after reading the information sheet. A series of either independence-priming pictures or interdependence-priming pictures were shown for 1 min. Participants completed manipulation checks and interpreted four facial expressions (2 races: Black and White x 2 gender: female and male). Participants reported their demographic information such as their age, race, and gender, and finally received a debriefing explaining the study.

Results

Table 1

Matrix of correlations

	Before	After	Self-construal	Priming condition
Before	-			
After	0.199*	-		
Self-construal	0.318**	0.720**	-	
Priming condition	-0.033	-0.031	-0.072	-

Note. Before = self-construal scores before priming; After = self-construal scores after priming; Self-construal = self-construal scores regardless of priming condition. The independent priming condition was coded as +3, and the interdependent priming condition was coded as -3.

* $p < 0.05$

** $p < 0.001$

Manipulation check. We computed a correlation matrix to analyze the effectiveness of the manipulation of self-construal priming (see Table 1). The matrix showed that participants' self-construal scores did not change as a result of the priming condition. The priming condition did not significantly correlate with participants' self-construal measured after the priming, $r = -.031$, $p > .05$. Participants scored similarly on their self-construal before and after the priming condition, $r = .199$, $p = .013$. The combined self-construal score significantly correlated with both participants' self-construal measured before and after the priming condition. We were interested in the effect of self-construal on their emotion understanding. If the self-

construal priming did not work, we could not examine the effect of participants' self-construal by using the priming condition as the independent variable. Therefore, participants' overall self-construal scores were used instead to assess the effect of self-construal on dependent variables in further statistical analyses. To adjust these changes, we revised H_1 from "independence-primed group would need less contextual information to interpret faces than interdependence-primed group" to "independent participants would need less contextual information to interpret faces than interdependent participants". We also revised H_4 from "independence-primed group would be more confident about their interpretation of expression compared to interdependence-primed group" to "independent participants would be more confident about their interpretation of expression compared to interdependent participants". Although the self-construal priming condition did not influence participants' self-construal scores, we theorized that it might influence dependent variables. Thus, we ran multiple repeated measures ANOVA to examine the main effect of priming condition on participants' needs for contextual information and their confidence in interpretation. The results suggested that the priming condition did not influence participants' needs for contextual information, $F(1, 201) = 1.13$, $p = .289$, $\eta^2 = .005$, and their confidence in interpretation, $F(1, 201) = 2.12$, $p = .147$, $\eta^2 = .006$.

Ratings of needs for contextual information. To test H_1 that interdependent participants would seek contextual information more than independent participants, a simple linear regression was conducted on ratings of needs for contextual information. Our hypothesis was supported, $F(1, 201) = 8.31$, $p = .004$, with an R^2 of .040. A unit increased of participants' self-construal, participants' needs for contextual information decreased 0.261, suggesting that participants who were more

individualistic reported fewer needs for contextual information than those who were more collectivistic.

Table 2

Descriptive statistics for outcome measures.

		Needs for Contextual Information		Recognition Accuracy		Confidence in Interpretation		Desired Affiliation	
Emotion	N	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Happy	71	3.43	1.42	0.95	.11	3.11	0.74	6.00	0.92
Fearful	70	4.18	1.06	0.31	.21	2.25	0.54	4.71	1.11
Neutral	62	4.81	0.90	0.69	.22	2.03	0.65	4.90	1.05

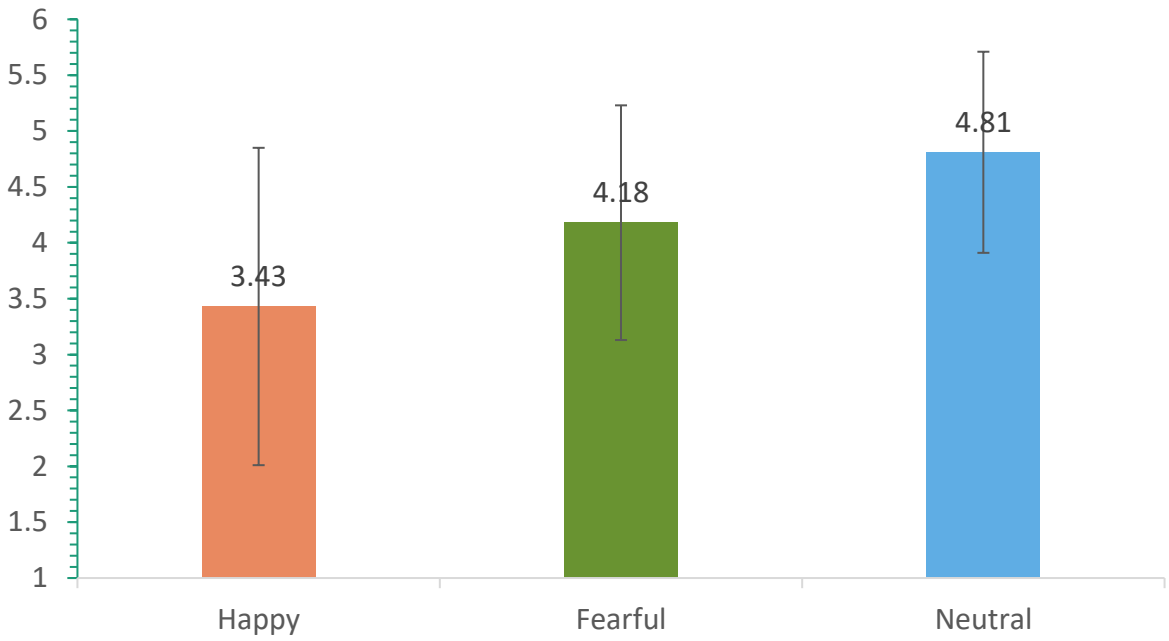
Note. Possible range: needs for contextual information, confidence in interpretation, and desired affiliation 1 to 7; recognition accuracy 0 to 1.

A repeated measures analysis of variance (ANOVA) was conducted to examine the effect of facial emotions on ratings of needs for contextual information. The results supported our second hypothesis that participants would seek the most contextual information when interpreting neutral faces than when interpreting fearful and happy faces. The means and standard deviations of each scale separated by facial emotions are presented in Table 2. The main effect of facial emotions on needs for contextual information was significant, $F(2, 200) = 23.6$, $p < .001$, $\eta^2 = .157$. Neutral faces elicited the highest needs for contextual information ($M = 4.81$, $SD = 0.90$). Fearful faces elicited higher needs for contextual information ($M = 4.18$, $SD = 1.06$) than happy faces ($M = 3.43$, $SD = 1.42$), $t(200) = 3.86$, $p < .001$. The results of a post-hoc comparison supported our third hypothesis that participants would seek the most contextual information to interpret neutral faces compared to fearful, $t(200) = 3.10$, $p = .002$, and happy faces, $t(200) = 6.84$, $p < .001$. The means of needs for contextual information separated by condition are presented in Figure 1. Since both self-construal and facial emotions had effects on ratings of needs for contextual information, a moderated regression was conducted to investigate the interaction effect of self-construal and facial emotions by using SPSS PROCESS. SPSS PROCESS is a computational tool assessing an observed variable OLS (ordinary least

squares) and logistic regression path analysis modeling. The overall model was significant, $F(5, 197) = 10.43$, $p < .001$, $R^2 = .21$, suggesting that participants' needs for contextual information negative correlated with their self-construal. However, the interaction effect of self-construal and facial emotions was not significant $F(2, 197) = .178$, $p = .837$, $R^2 = .001$.

Figure 1

Participants' Needs for Contextual Information



Accuracy of facial recognition. To test H_3 that the recognition accuracy of the happy faces would be higher than of the fearful faces, we submitted percentages of correct recognition of facial expressions to a chi-square analysis. The results showed a significant association between facial emotions and recognition accuracy, $X^2(8) = 186.24$, $p < .001$, supporting our second hypothesis that the recognition accuracy would be based on facial emotions. The mean of proportion of recognition accuracy was the highest for happy faces ($M = .95$, $SD = .11$) compared to fearful faces ($M = .31$, $SD = .21$) and neutral faces ($M = .69$, $SD = .22$). An additional regression analysis explored the association between recognition accuracy and ratings of

contextual information across all facial emotions. The correlation between recognition accuracy and needs for contextual information was significant, b = -.86, p = .001,

Figure 2

Participants' Confidence in Interpretation

suggesting that participants who reported higher needs for contextual information tended to have lower recognition accuracy than those who reported lower needs for contextual information.

Confidence in Interpretation and Desired Affiliation Measures. A linear regression analysis was conducted on confidence in interpretation to test H_4 that independent participants would be more confident about their interpretation of expression compared to interdependent participants. It showed that H_4 was supported, $F(1, 201) = 49.2$, $p < .001$, with an R^2 of .197, suggesting that independent participants were more confident in their interpretation than interdependent participants. The main effect of facial emotions on confidence in interpretation was also significant, $F(2, 200) = 52.5$, $p < .001$, $\eta^2 = .201$. The results of post-hoc comparison suggested that participants who looked at happy faces had the highest

confidence in interpretation (M = 3.11, SD = 0.74) than those who looked at fearful faces (M = 2.25, SD = 0.54; $t(200) = 7.81$, $p < .001$) or neutral faces (M = 2.03, SD = 0.65), $t(200) = 9.57$, $p < .001$. Participants who looked at fearful faces reported marginally higher confidence in interpretation than those who looked at neutral faces, $t(200) = 1.99$, $p = .05$ (see Figure 2).

We also computed a regression of participants' confidence in interpretation on desired affiliation to test H_5 that highly confident participants would be more comfortable to have further interactions than less confident participants. As expected, highly confident participants reported higher desired affiliation than less confident participants, $b = .654$, $t(201) = 7.01$, $p < .001$. Facial emotions also impacted participants' desired affiliation, $F(2, 200) = 31.8$, $p < .001$, $\eta^2 = .171$. Participants who looked at happy faces reported higher desired affiliation (M = 6.00, SD = 0.92) with the target than those who looked at fearful faces (M = 4.71, SD = 1.11, $t(200) = 7.41$, $p < .001$) and others who looked at neutral faces (M = 4.9, SD = 1.05, $t(200) = 6.15$, $p < .001$). Furthermore, facial emotions might be a confounding variable of the association between participants' confidence in interpretation and desired affiliation. Similarly, both self-construal and facial emotions had effects on confidence in interpretation, Thus, we used SPSS PROCESS to examine the extent to which participants' confidence in interpretation was a mediator of the association between facial emotions and participants' desired affiliation, and if participants' self-construal moderated the association between confidence in interpretation and desired affiliation (model 7). The overall model was supported with the index of moderated mediation = -.10 (95% CI = -.22; -.01). As zero is not within the CI this indicates a significant moderating effect of self-construal on facial emotions on the indirect effect via confidence in interpretation. However, one thing to note here is that our sample size

was small, so the analysis might be underpowered. When comparing happy facial emotion and fearful facial emotion, the indirect effect was significant, b = -.33, SE = .11, 95% CI [-.55, -.13]. Since the 95% confidence interval did not include zero, we would say that mediation had occurred for happy and fearful facial emotions. Similarly, when comparing happy facial emotion and neutral facial emotion, the indirect effect was also significant, b = -.41, SE = .13, 95% CI [-.67, -.16]. The 95% confidence interval did not include zero, so we would say that mediation also had occurred for happy and neutral facial emotions. In terms of the moderator effect of self-construal, the interaction effect of facial emotions and self-construal was significant, $F(2, 197) = 3.30$, $p = .039$, $R^2 = .021$. More specifically, when comparing happy and fearful faces, the interaction of facial emotions and participants' self-construal was not significant, b = -.21, $t(197)$ = -1.89, $p > .05$. When comparing happy and neutral faces, the interaction of facial emotions and participants' self-construal was significant, b = -.27, $t(197)$ = -2.38, p = .02, suggesting that participants' self-construal especially influenced participants' confidence in interpretation of neutral facial expression.

Table 3

Pearson Correlations Among Pleasantness Ratings and Recognition Accuracy of Fearful Faces

	1	2	3
1. Valence	-		
2. Arousal	0.031	-	
3. Accuracy	-0.242*	0.145	-

*. Correlation is significant at the 0.05 level (2-tailed).

Ratings of pleasantness and the correlation between ratings of pleasantness and recognition accuracy. The results of Cook's distance ruled out three outliers of pleasantness ratings of White female happy face and one outlier for every other face.

To test H_6 that there would be a weak or no correlation between participants' pleasantness ratings and participants' accuracy of fearful faces, we computed a correlation matrix (see Table 3). The results partially supported our hypothesis that the correlation between ratings of valence and recognition accuracy for fearful faces was significant (r = -.242, p = .042), but the correlation between ratings of arousal and recognition accuracy for fearful faces was not significant (r = .145, p = .228). Ratings of valence and arousal for fearful faces was also not significant (r = .031, p = .797). In other words, participants who rated fearful faces as negative had higher recognition accuracy than those who rated fearful faces as positive regardless of their ratings of arousal.

Discussion

The present study offers a direct examination of the relation between self-construal and emotion understanding. Consistent with Aviezer et al. (2017) claim regarding the importance of context effects, the present study found that people used contextual information when making emotional judgments because facial expressions are inherently ambiguous. People also can explicitly report their needs for contextual information when interpreting facial expression. The context effects occurred within the expresser as well as the observer. Interdependent participants had higher contextual information ratings than independent participants. This finding supports the theory that interdependent individuals believe that situation is the cause of facial expression (Markus & Kitayama. 1991). Interdependent individuals use facial expressions to communicate with others, not to express their internal states. Thus, they believe that facial expressions do not provide enough information about the emotional state of the expresser. Hence, in the present study, interdependent participants needed situational information to interpret facial expressions.

Interdependent participants also had lower confidence than independent participants, supporting the previous finding that interdependent people were less confident in their decision-making ability than independent people (Mann et al., 1998). We also found that participants' confidence in interpretation impacted their desired affiliation. The positive correlation between confidence in interpretation and interpersonal engagement reflected that participants were comfortable interacting with others they could easily interpret. Similarly, they were willing to interact with others showing happiness because they could easily recognize the happy faces. Participants were also not willing to interact with the target showing fear because they could not accurately interpret the expression. In sum, context effects within the perceiver influenced how participants made emotional judgments.

Regardless of their self-construal, participants reported the highest needs for contextual information when the target facial expression was the most ambiguous. More specifically, the degree of perceptual similarity is associated with the effect of contextual information (Hassin et al., 2013). When the perceptual information of expression does not provide enough information to make an emotional judgment, people cannot accurately interpret the expression (Nummenmaa & Calvo, 2015). Therefore, in the present study, participants had the lowest recognition accuracy of fearful faces, replicating previous findings that people are not good at recognizing fearful faces but good at recognizing happy faces. Participants also sought more contextual information for neutral faces than happy and fearful faces because neutral faces had the least perceptual information among these three facial emotions. On the contrary, participants had the highest accuracy and the lowest needs for contextual information when interpreting happy faces because happy faces provided sufficient

perceptual information and had a low degree of perceptual similarity with other facial expressions (Leppänen & Hietanen, 2004).

According to Calvo and Nummenmaa (2016), expression recognition does not involve affective processing. However, the present study found that participants' ratings of valence and recognition accuracy were significantly correlated. Participants misinterpreted fearful faces when they perceived the faces as positive. Although the finding was not consistent with Calvo and Nummenmaa's claim, the finding is not surprising. If participants perceived the opposite pattern of expression valence, they might misinterpret the expression. For instance, if people perceive a crying face as positive, they will interpret the face as happy (Aragón & Bargh, 2018), leading the perceived valence and recognition accuracy negatively correlated. On the other hand, if people perceive a fearful face as negative and misinterpret the face as disgusted, then the association between ratings of valence and recognition accuracy might not be significant. This non-significant result would confirm the previous findings that affective information does not provide sufficient evidence to interpret a facial expression.

This study's significant results demonstrate that people interpret expressions differently, emphasizing context effects in emotion understanding. Self-construal, a context effect within the observer, influences people's emotional judgments. Independent individuals are confident to interpret a facial expression because they believe that the expression reflects the target's current inner feelings. Interdependent individuals need contextual information to interpret the face because they perceive situations as the causes of the expression. Context effects within the expresser also influence how people understand a facial expression. People are good at recognizing expressions with sufficient perceptual information because they are not confused by

the perceptual similarity. If the expression’s perceptual information is not significantly distinctive, people cannot accurately recognize ambiguous expressions. Facial expressions with less perceptual information require people to seek out more contextual information. Still, expressions with sufficient perceptual information will lead people to be confident to make emotional judgments. The present study's findings added to the previous findings that affective information does not help people understand a facial expression.

The present study results also serve as the basis for future research on how people interpret emotional expressions in the real world. When people communicate with each other, they often use a facial expression as a communicative tool. People need to express as well as understand a facial expression. Perceptual information and distinctiveness of facial features are crucial to expression recognition. Calvo and Nummenmaa (2015) argue that a facial configuration's saliency and distinctiveness are associated with a particular expressive category. These two characteristics reduce facial expression ambiguity, allowing the observer to interpret an expression to a specific emotion category with minimal interference. When the perceptual information and distinctiveness of information are not sufficient, people need contextual information to reduce the perceptual similarity. Therefore, the present study proposes that perceptual information and contextual information will be factors of emotion perception.

Future research should include spontaneous facial expressions, which are closer to everyday expressions. People do not always show prototypical, full-blown, and posed facial expressions. The present study also allowed participants to look at expressions multiple times when they were answering questions. In reality, people do not have opportunities to look back at the expression when they make emotional

judgments. The expression does not stay for a long time. The third limitation of the present study is that participants were not freely labeling facial expressions. There is a possibility that people have different interpretations from what the forced-choice options provided because the category of emotions is arbitrary (Barret, 2006). Lastly, the present study did not use the stimuli accounting for in-group advantage. Facial expressions are generally recognized better when posed and judged by members of the same or different cultures (Elfenbein & Ambady, 2002; Elfenbein & Ambady, 2002). Shared culture increases experience-dependent plasticity; individuals could tune the expression recognition system significantly by exposure to different expressions within one culture (Calvo & Nummenmaa, 2015). People have higher recognition accuracy when they look at same race expressions than when they look at different race expressions.

In conclusion, self-construal influences how people understand facial expressions. Independent individuals perceive facial expression as a cognitive tool, reflecting inner feelings; however, interdependent individuals perceive the facial expression as a socio-cultural tool, maintaining positive relationships with others (Markus & Kitayama, 1991). Consequently, independent and interdependent individuals have a different cognitive appraisal of emotion expressions (Bender et al., 2012). Future research should investigate the interaction effect of self-construal and types of contextual information on emotion understanding.

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Appendix A – Prescreening Self-construal

Indicate the degree to which you agree or disagree with the statements below.

	Strongly disagree	Moderately disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Moderately agree	Strongly agree
I will sacrifice my self-interest for the benefit of the group	-3	-2	-1	0	1	2	3
Being able to take care of myself is a primary concern of mind	3	2	1	0	-1	-2	-3
If my brother or sister fails, I feel responsible	-3	-2	-1	0	1	2	3

Even when I strongly disagree with group members, I avoid and argument	-3	-2	-1	0	1	2	3
I am comfortable with being singled out for praise or rewards	3	2	1	0	-1	-2	-3
I prefer to be direct and forthright when dealing with people I've just met	3	2	1	0	-1	-2	-3

Appendix B – Manipulation Checks for Self-construal

Indicate the degree to which you agree or disagree with the statements below according to your current feeling.

	Strongly disagree	Moderately disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Moderately agree	Strongly agree
My happiness depends on the happiness of those around me	-3	-2	-1	0	1	2	3
It is important to me to respect decisions made by the group	-3	-2	-1	0	1	2	3
I enjoy being unique and different from others in many respects	3	2	1	0	-1	-2	-3
My personal identity, independent of others, is very important to me	3	2	1	0	-1	-2	-3

[Trafimow et al.'s Writing Task]

Independence-priming Group: for the next 2 minutes, you will not need to write anything. Please think of what makes you different from your family and friends. What do you expect yourself to do?

Interdependence-priming Group: for the next 2 minutes, you will not need to write anything. Please think of what you have in common with your family and friends. What do they expect you to do?

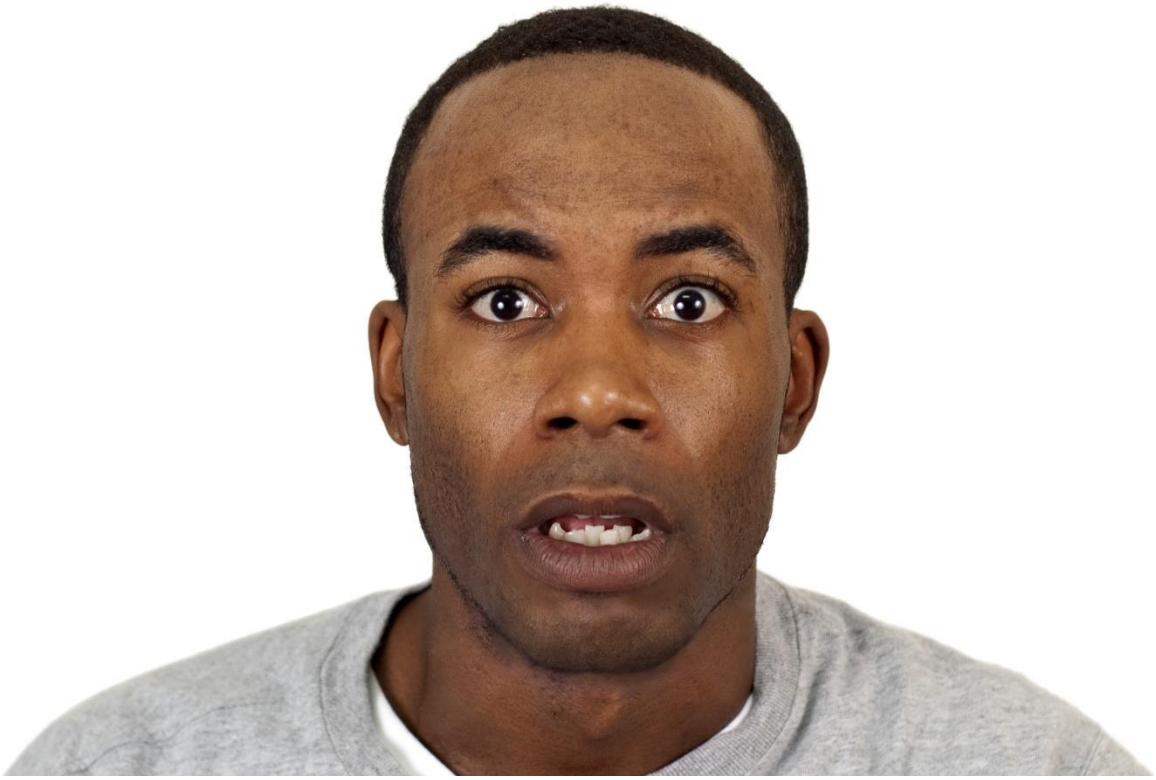
Appendix C – Independence-priming Pictures

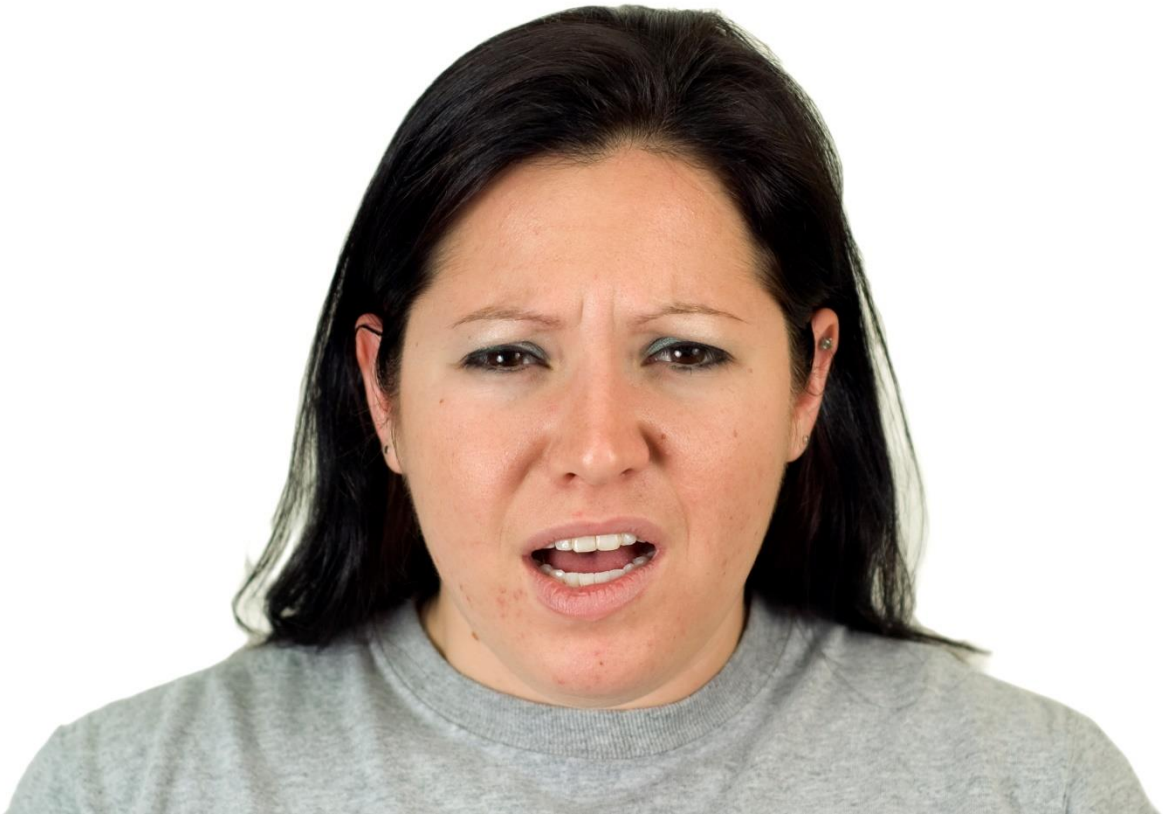
Me

Appendix D – Interdependence-priming Pictures

we

Appendix E – Stimuli





Appendix F – Dependent Measures

Please tell us to what extend you agree with following statements.

	Extremely disagree	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Extremely agree
It is hard to understand this person's feeling without knowing what this person has just experienced							
In order to fully understand the emotion displayed I need to know about this person's background							
It is difficult to interpret this emotion without information about the person's current situation							
To get a good understanding of this person's emotion, it would be helpful to know what situation they expect to be in next							

What emotion do you see?

Anger	Fear
Disgust	Sadness
Happy	Neutral
Surprise	

How positive or negative emotion is this expression?

Very negative	moderately negative	Somewhat negative	Neutral	Somewhat positive	Moderately positive	Very positive
-3	-2	-1	0	1	2	3

How much emotion arousal is in this expression?

Very low	Moderately low	Somewhat low	Neither low nor high	Somewhat high	Moderately high	Very high
-3	-2	-1	0	1	2	3

Please tell us your level of confidence in interpreting this expression

Not at all confident	A little confident	Somewhat confident	Quite a bit confident	Extremely confident
0	1	2	3	4

How comfortable are you to have further interactions with this person?

Very uncomfortable	Moderately uncomfortable	Slightly uncomfortable	Neutral	Slightly comfortable	Moderately comfortable	Very comfortable

-3	-2	-1	0	1	2	3

[Demographic Questions]

1. What is your age?
2. Choose one or more ethnicities that you consider yourself to be
    A. White or European American
    B. Black or African American
    C. Latino
    D. Asian
    E. Asian American
    F. Native Hawaiian or Pacific Islander
    G. American Indian or Alaska Native
    H. Bi-racial
    I. Other
3. What is your gender?

Appendix G – Recruiting Materials

"Analyzing Faces:

We are interested in people's emotional judgments of faces. You will look at a series of facial expressions and then answer questions about them. The research study should take approximately 30 minutes. You must be at least 18 years of age or older, English speaking, enrolled in the Psychology Subject pool, and you must also have not participated in another Analyzing Faces research study.

Faculty Sponsor: Ralph Erber, PhD"

Appendix H – Information Sheet

[Analyzing Faces]

Principal Investigator: Youlim Kim (Graduate student at DePaul University)

Institution: DePaul University, Chicago, Illinois, USA

Faculty Advisor: Ralph Erber, PhD, Professor of Psychology

We are asking you to be in a research study because we are trying to learn more about how people analyze facial expressions. This study is being conducted by Youlim Kim, a graduate student at DePaul University as a requirement to obtain her master's degree. This research is being supervised by her faculty advisor, Ralph Erber. We hope to include about 300 people in the research.

You are invited to participate in this study because you are over the age of 18 in the Psychology Subject Pool, an English speaker at DePaul University, and have not participated the Analyzing Faces series experiment. This study is not approved for the enrollment of people under the age of 18.

If you agree to be in this study, being in the research involves rating information you would need to make emotional judgments when looking at facial expressions. We will also collect some personal information about you such as your demographic information about age, gender, and race. If there is a question you do not want to answer, you may skip it. The study should take about 30 minutes to complete.

Research data collected from you will be anonymous. We are not able to tell you the complete details about the research and why we are doing what we are doing, because we would not get good results if we did. The full details about the research and why we did it this way and what we hope to find will be explained to you after you complete the research.

You will be given 0.5 psychology subject pool credit for participation in the research. At the end of the survey you will be taken to a different page to provide your subject pool number. You must provide your subject pool number in order to be given credit.

Your participation is voluntary, which means you can choose not to participate. There will be no negative consequences, penalties, or loss of benefits if you decide not to participate or change your mind later and withdraw from the research after you begin participating. Your decision whether or not to be in the research will not affect your grades or standing at DePaul University. You may withdraw from the research at any time.

The researcher may remove you from the study without your agreement when you do not follow the instructions, you no longer meet the inclusion criteria for the study, or you are no longer able to complete the study tasks.

The research records will be kept and stored securely. Your information will be combined with information from other people taking part in the study. When we write

about the study or publish a paper to share the research with other researchers, we will write about the combined information we have gathered. We will not include your name or any information that will directly identify you. Some people might review or copy our records that may identify you in order to make sure we are following the required rules, laws, and regulations. For example, the DePaul University Institutional Review Board may review your information. If they look at our records, they will keep your information confidential.

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study or you want to get additional information or provide input about this research, you can contact the researcher, Youlim Kim (ykim85@depaul.edu) or Ralph Erber, PhD (rerber@depaul.edu).

This research has been reviewed and approved by the DePaul Institutional Review Board (IRB). If you have questions about your rights as a research subject, you may contact Jessica Bloom in the Office of Research Services at 312-362-6168 or by email at jbloom8@depaul.edu.

You may also contact DePaul's Office of Research Services if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You can keep or print a copy of this information to keep for your records.

You have read this information sheet, and by clicking "Yes, I agree to participate" option below, you are indicating your affirmative agreement to be in the research.

Appendix I - Debriefing

Thank You for Your Participation

Thank you for participating in the Analyzing Faces II study. This research was conducted by Youlim Kim (a graduate student at the Department of Psychology at DePaul University) and Ralph Erber, Ph.D (Department of Psychology at DePaul University). We conducted this study to gain insight into how self-construal influences how people evaluate what others may be feeling based when their facial expressions provide few cues. In this experiment, participants were randomly assigned to either independence-priming condition or interdependence-priming condition. In the independence-priming condition, participants looked at pictures about individuals; in the interdependence-priming condition, participants looked at pictures about groups. Participants were then additionally randomly assigned to one of three facial emotions groups: open-mouth smiling faces, fearful faces, and neutral faces. Participants were asked to report if they needed contextual information about the target's background, current situation, and forth experienced to interpret the target's facial expression. We expected that participants would need the most contextual information when judging a neutral face. On the contrary, they would not seek out contextual information when judging open-mouth smiling faces. We hypothesized that self-construal indeed can impact participants' needs for contextual information. Independent participants would need contextual information less than interdependent participants because independent participants had higher confidence of their decisions than interdependent participants had. That's why we asked you to rate needs for contextual information and confidence of interpretation when you are making emotional judgments.

To learn more about our research, see the following studies:

Hassin, R. R., Aviezer, H., & Bentin, S. (2013). Inherently ambiguous: Facial expressions of emotions, in context. *Emotion Review*, *5*(1), 60-65.

Matsumoto, D., Hwang, H. S., & Yamada, H. (2012). Cultural differences in the relative contributions of face and context to judgments of emotions. *Journal of Cross-Cultural Psychology*, 43(2), 198-218.

If you have any questions about the study, please do not hesitate to contact Youlim Kim at: ykim85@depaul.edu. If you feel you have any questions about your rights as a participant in this research, or if you feel that you have been placed at risk, you can contact the Director of Research Compliance at (312) 362-7593 or by email at sloesspe@depaul.edu.